The value of proper soil testing and use in precision Ag

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Overview

- Long term corn yield response and P removal with fertilizer placement.
- Soil test P variability and sampling considerations.
- Soil test K, pH as affected by precision nutrient management.
- The role of soil testing related to other tools such as yield mapping for P.

Background

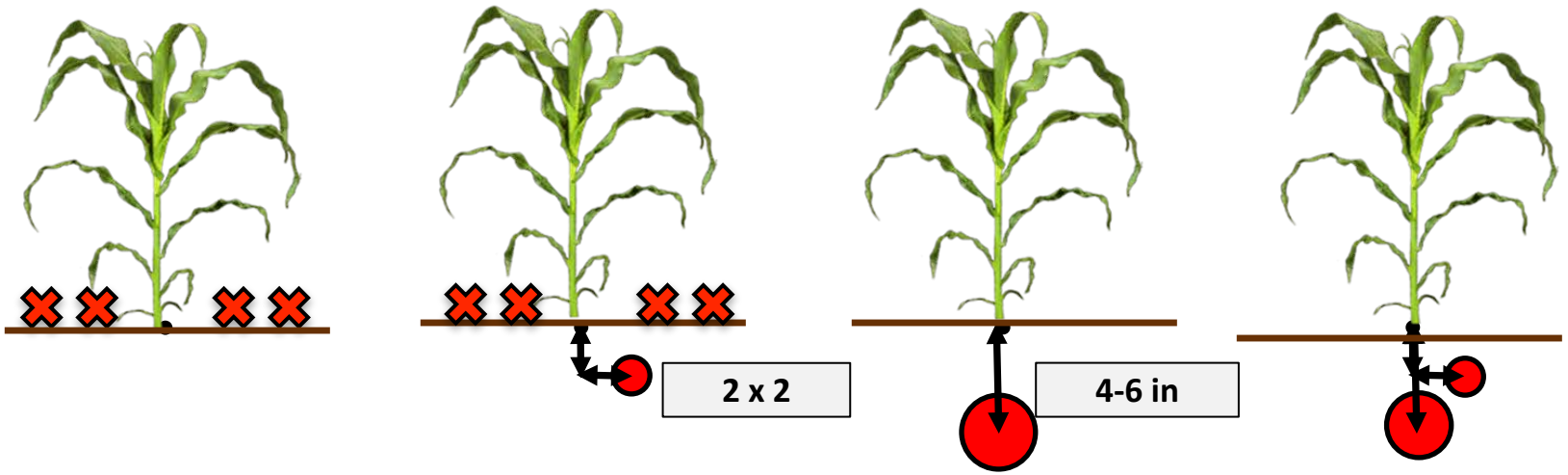
- Multiple tools available to access field scale variability
  - Imagery, soil EC, yield maps etc.
- Sampling approach in the field: Grid vs zone, combination, grid size, etc.
- “Small scale” variability affected by long term management such as tillage system, planting direction, and fertilizer placement.

Background

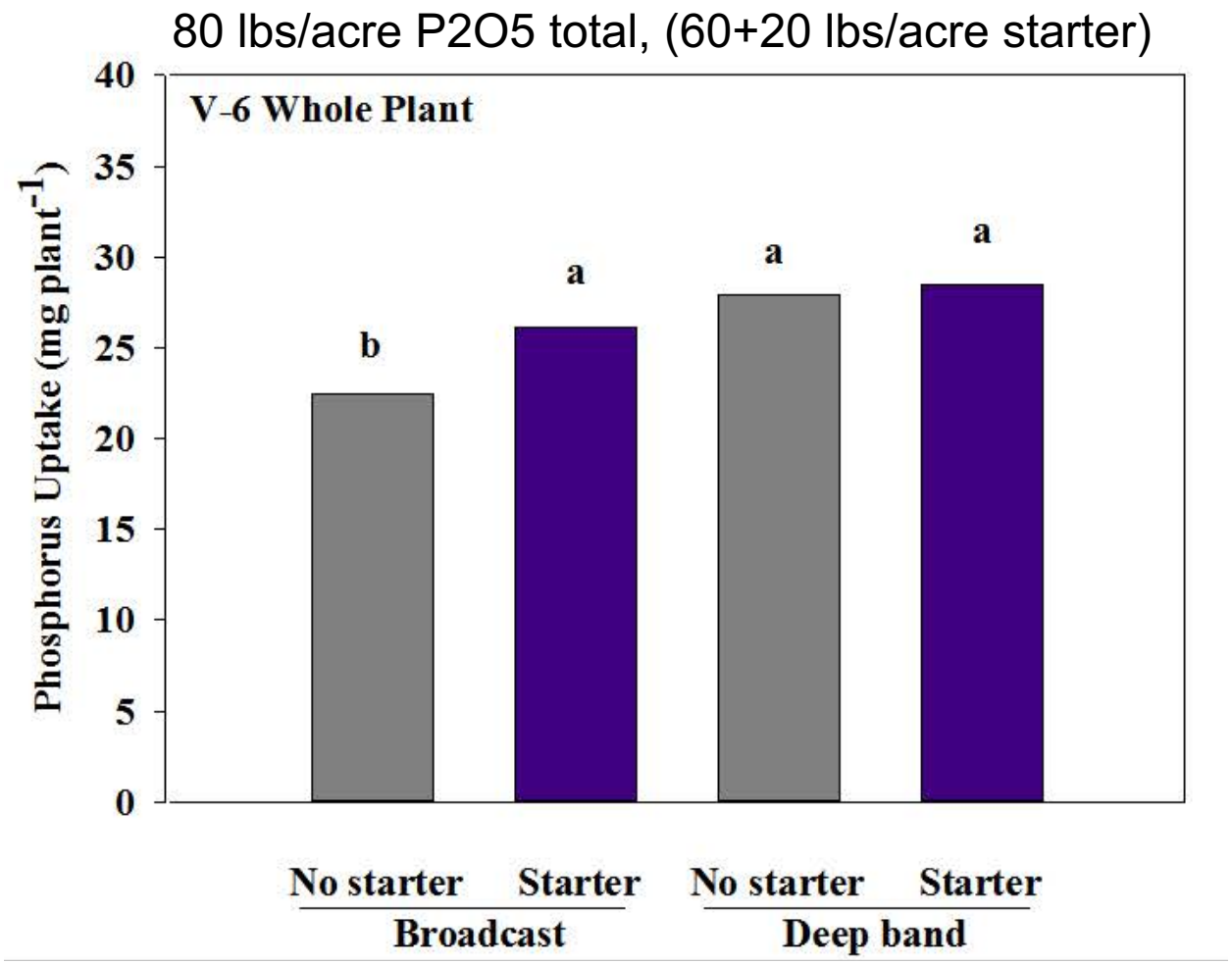
- Changes in nutrient distribution (stratification) in the soil can affect soil test results and final recommendations.
- Precision nutrient placement can improve agronomic response, but also contribute with variability.
- What recommendations are we using? Correlation-calibration and scale/detail for these recommendations.

Fertilizer placement under strip-till 80 lbs of P2O5 before corn

- 3 locations
- >10 years



Corn phosphorus uptake, average of 10 years



Scandia KS, average of 10 years

Corn response to P placement

80 lbs/acre P2O5 total, (60+20 lbs/acre starter)

Scandia KS, average of 10 years

Soybean response to P placement

80 lbs/acre P_2O_5 total, (60+20 lbs/acre starter)

Scandia KS, Average of 10 years

P balance after 10 years of corn-soybean (application – removal)

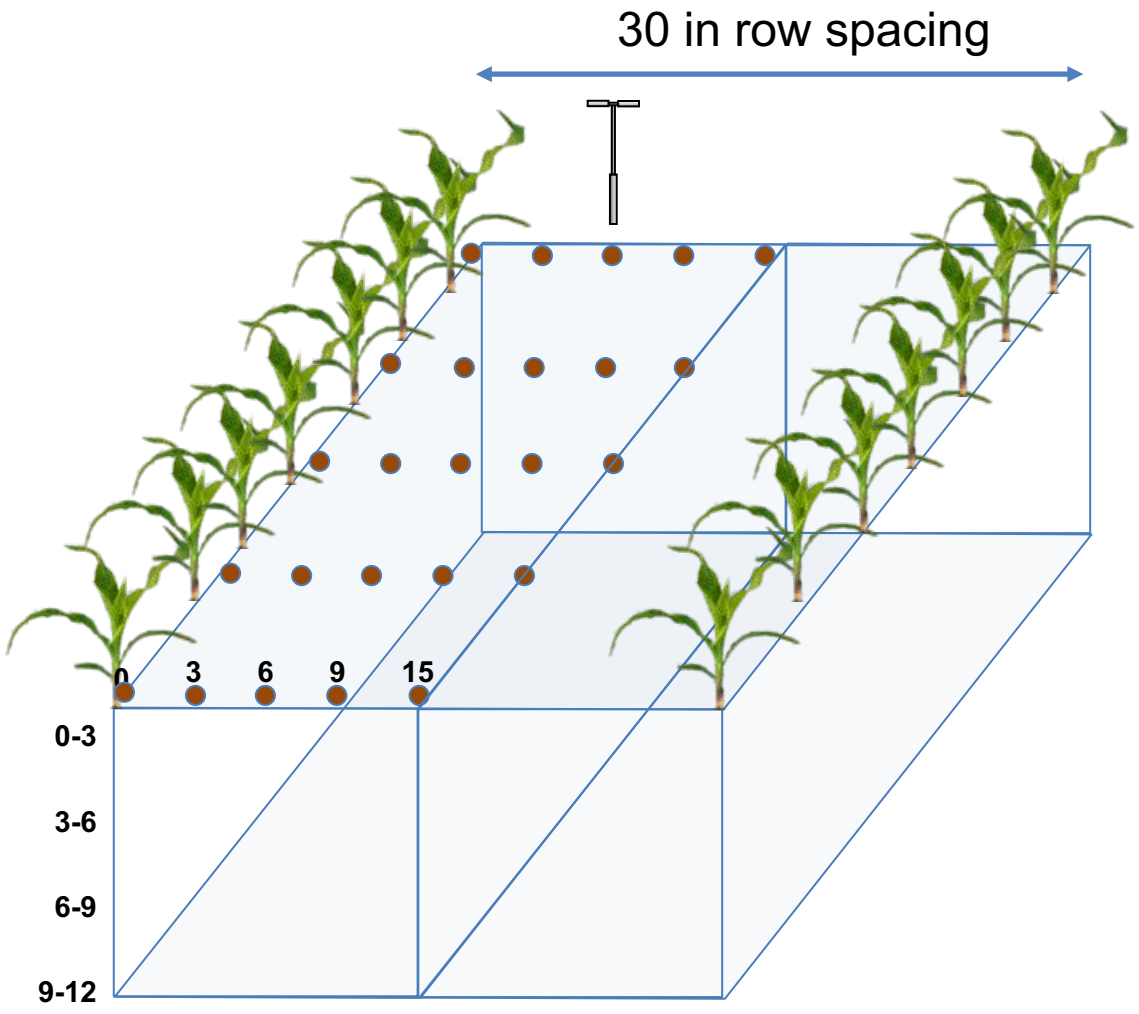
Summary – crop response

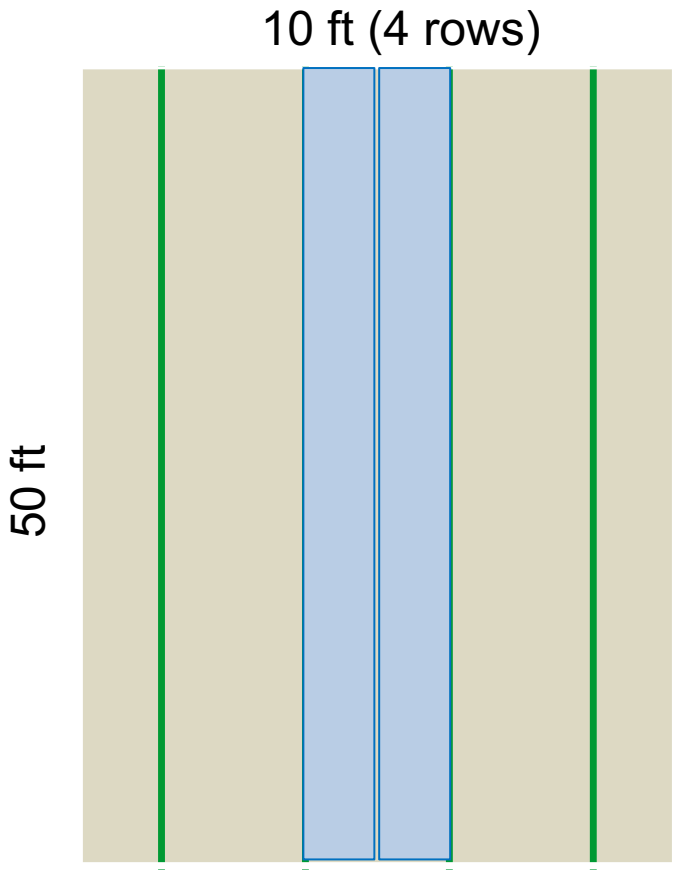
- Increased corn early growth with band and starters.
- Corn yield was not affected by phosphorus placement
  - Average higher soybean yield with broadcast and/or starters
- Slightly higher P removal with broadcast (~40 lbs/P2O5 in 10 years)

Intensive soil sampling

- Late fall after harvest to include 10 years of cropping.
- Use pre-drilled boards to maintain distance from the row.
- Sampling probe of 0.75 in diameter.
- Samples collected after corn and soybean 4 replications each (combined for this presentation).

Intensive soil sampling- long term plots





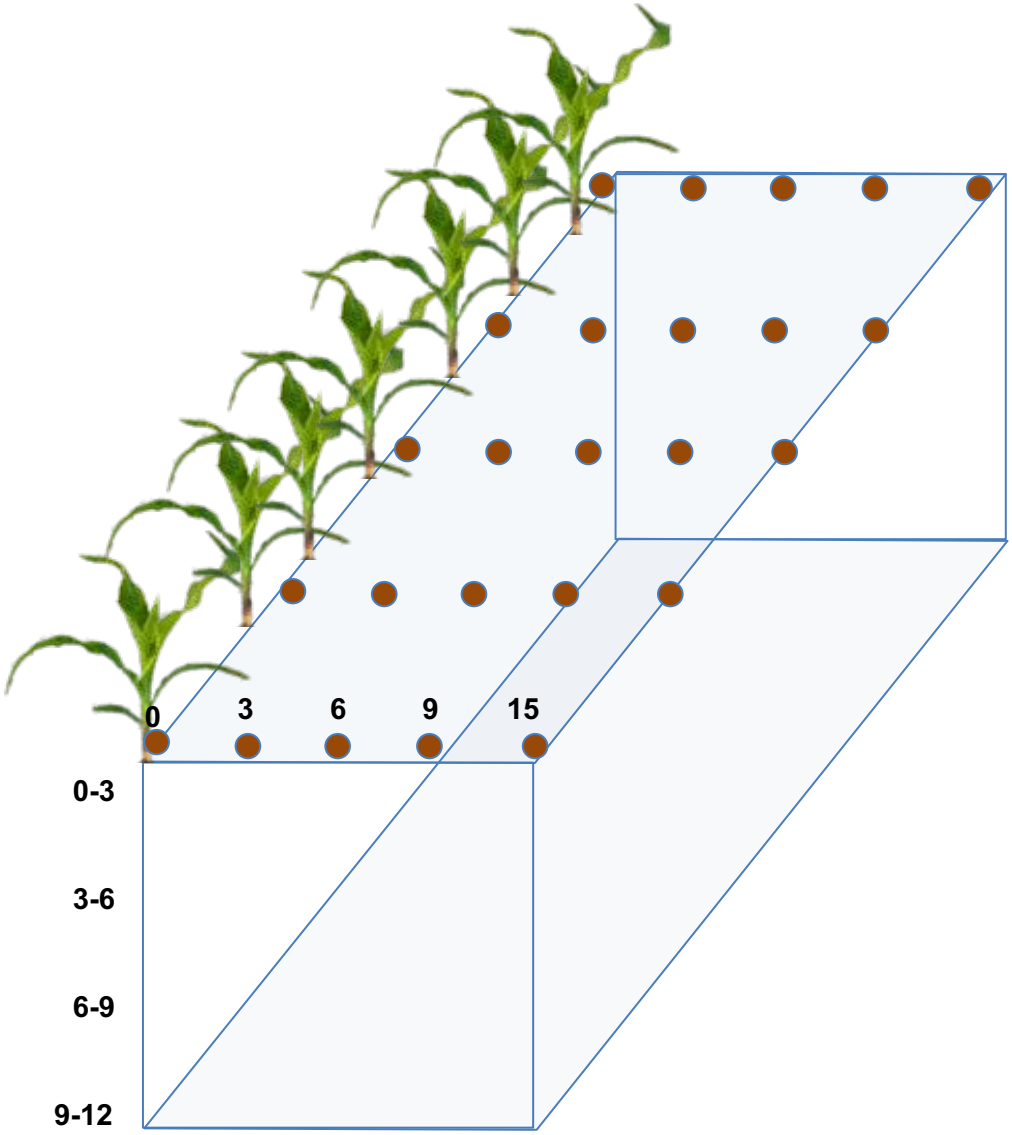
Intensive soil sampling

Distance from the center of the row (in)

Sampling depth (in)	0	3	6	9	12	15
0-3						
3-6						
6-9						
9-12						

24 samples

Intensive soil sampling- long term plots



Soil test P after 10 years, no P fertilizer application (control)

Soil test P with broadcast P fertilizer (80 lbs)

Mean= 14.7 ppm

Soil test P with deep-band P fertilizer (80 lbs)

Mean= 16.1 ppm

Average and standard deviation soil test P for broadcast and deep-band P

16.1

14.7

Number of soil cores and variability in soil test P

Previous P fertilizer placement in the rotation

Maxwell, 2017

Soil test potassium as affected by row position

Changes in soil pH with N application under minimum tillage

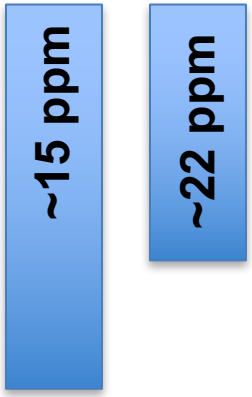
UAN w/ strip-till

Anhydrous-Ammonia

Phosphorus and OM stratification after 25+ years of NT

pH stratification after 25+ years of NT

Nutrient stratification and sampling depth

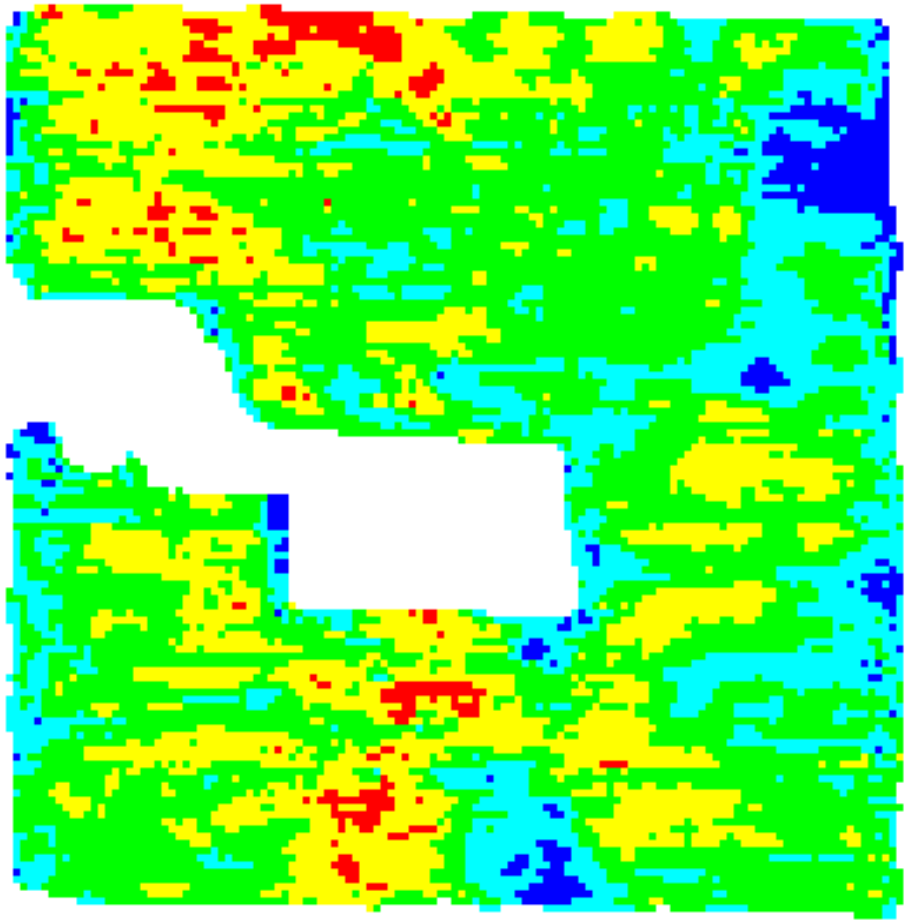


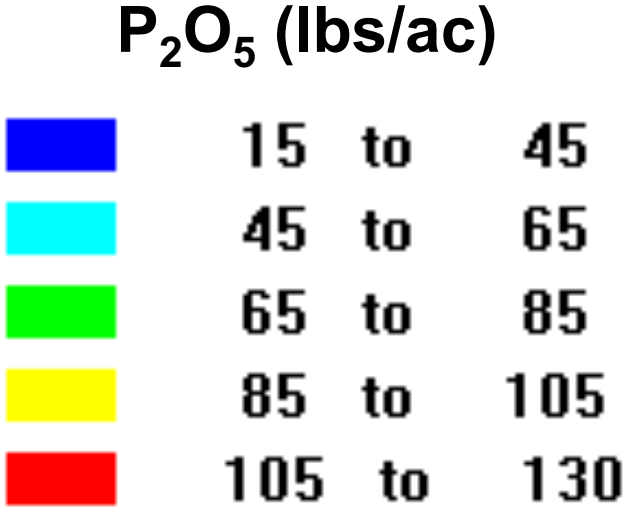
Consistent sampling depth with vehicle mounted soil sampling unit vs hand-probes?

Soil test phosphorus distribution

- Placements resulted in different P distributions.
- Broadcast had highest STP in the upper 3 in across all sampling positions.
- Deep banding concentrated STP: levels above 50 ppm in the row for the upper 6 in.

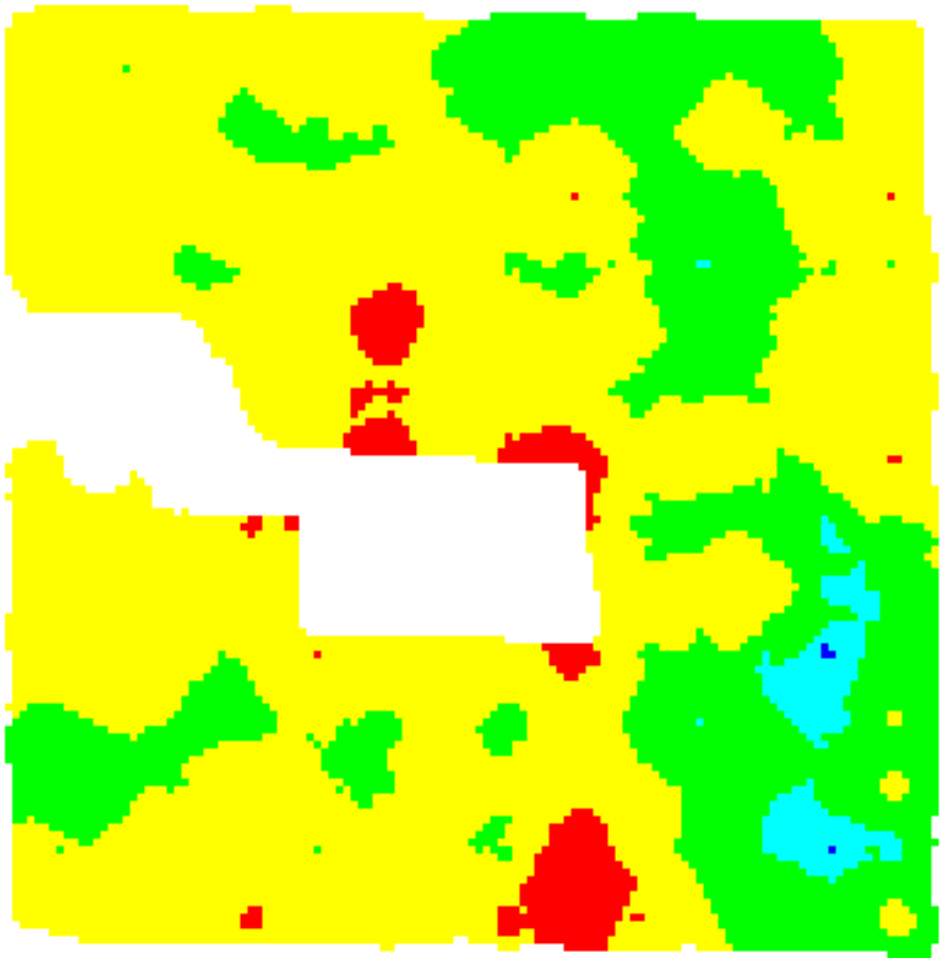
Using yield monitor data to develop P removal maps

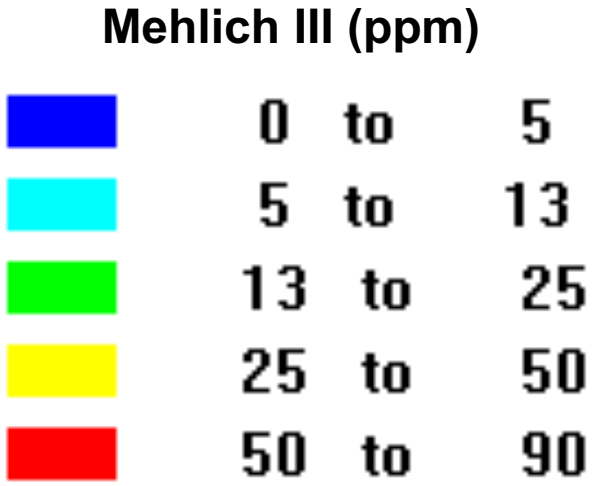




(4 years of P removal, Haag, 2014)

Soil test P





(Haag, 2014)

Combine layers of information for directed soil sampling

- Can yield monitor data help “predict” soil test P in the field?
- Other factors affecting soil test P over time:
  - Soil types and texture
  - Topography
  - Residue type and nutrient cycling
  - Manure applications

Choosing a soil sampling strategy

- Consider the sources and degree of field variability.
- Consistency in depth of sample.
  - ✓ 0-6” for immobile nutrients
  - ✓ 0-3” only for pH in No-till systems
- Appropriate number of subsamples.

Soil sampling with high soil test variability

- Collecting soil samples based on the exact location of strip-till fertilizer band is difficult for some crop rotations.
- The “average” soil test value may be a better index for potential response.
- Increase the number of cores (sub-sample) for soil sample will reduce variability.
  - Consider using “ratios” when possible

How soil test fits in a precision Ag program?

- Soil testing remain as the first and most important step for a good precision nutrient management program.
- Data interpretation: relating soil test numbers to actual crop response.
- What is the source of recommendations? Sampling depth? Correlation-calibration data

Questions?

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